



IS COVID-19 AWARENESS UP TO THE MARK? A QUESTIONNAIRE BASED CROSS SECTIONAL STUDY AMONG HEALTHCARE STUDENTS IN SOUTH INDIA

Physiology

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ABSTRACT

Background: Despite the best efforts to halt the pandemic, it has not been successful. The cognizance and awareness of people towards this infectious virus remains the superior factor in limiting the widespread of the disease. Healthcare students play a pivotal role in disseminating information to the public. **Materials and Methods:** A pre-validated questionnaire adapted from a similar study conducted on health care students in Mumbai was drafted as an online form, and circulated among health care students in South India via various social media platforms. **Result:** Out of the 507 responses, with 71.6% were females and the rest were males. The mean age of the study population was 20.65 ± 1.41 years. The mean score was 12.17 ± 1.927 . Degree of awareness, according to this questionnaire study, was found to be highest among the MBBS students and least among students of Allied Health Science. **Conclusion:** The degree of awareness was found to be lesser than what is expected among healthcare students despite the pandemic being present for more than 6 months. Various interventions are required to decrease this knowledge gap in the form of training sessions, webinars and other educational sessions, that may be conducted periodically for all healthcare students, and wherever possible for the general public as well. The students should be encouraged to actively share their knowledge with the community.

KEYWORDS

Awareness, Healthcare Students, COVID-19

INTRODUCTION

COVID 19, an epidemic triggered by the new corona virus SARS-CoV-2 is now the centre of the scientific community's attention and efforts^[1]. Its clinical presentation ranges from being asymptomatic to becoming a severe disease with high mortality rate^[2]. On March 11, 2020, the World Health Organisation had declared the COVID-19 as a pandemic^[3]. The Government of India was one of the first few countries who took serious measures in order to contain the spread of this disease through several rounds of nationwide lockdowns and strict quarantine^[4]. Despite its best effort, India is now the second worst affected country just behind the United States of America, in the total number of cases recorded.

As of October 8th 2020, there are 3,58,97,739 active cases and 10,48,781 confirmed deaths around the world^[5]. India has 68,35,655 confirmed active cases and 1,05,526 confirmed deaths due to COVID-19^[6]. The reproduction ratio of the virus is between 2.4 and 2.7^[7]. With over 70,000 new cases daily (as of October 8), the spread of infection is more rapid than ever.

Controlling of the spread of this disease has become the need of the hour^[8]. Fear of contracting the disease serves as a double edged sword, with people trying to protect themselves by taking necessary precautions. Inherent fear might also hinder further efforts to intercept the virus spread^[9]. Hence COVID-19 public awareness garners centre stage in pandemic management^[10,11]. One of the most effective ways to protect oneself is through knowledge of the disease.

Healthcare students pursuing professional courses can help maintain or restore physical, mental, or emotional well-being of the common population. These students can create awareness about the disease, its aetiology, mode of transmission and possible preventive measures amongst their peers who in turn can assure a wider spread of

information. Their positive attitudes will ensure that they, and as a result the general public, will have hope and contribute positively to the fight against Covid-19^[12,13,14].

This study will be helpful in understanding the level of awareness and knowledge among healthcare students, who are now being recruited in Primary Healthcare Centers in parts of the country where there is excessive burden on the healthcare system.

Studies to assess the awareness and perception of COVID-19 have been conducted in a few countries, especially in the Middle East^[15,16]. In the Indian population, a study on the awareness of COVID-19 among healthcare students and professionals has been done in the Mumbai region^[17]. However, there have not been any studies to assess the awareness of COVID-19 among healthcare students in the South India. This study aims to evaluate the degree of awareness among students and its effects. It will secondarily make students acquainted with information if they weren't already familiar with, in order to make them more aware about the hand hygiene practices and proper way of wearing masks and PPE.

MATERIALS AND METHODS

This was a cross-sectional study among students of health care institutions in South India, using a pre-validated questionnaire adapted from the current interim guidance and information for healthcare workers published by the Centers of Disease Control and Prevention (CDC), updated on March 7, 2020^[18]. Permission was taken for using the validated questionnaire from the concerned authority.

Online form containing the questionnaire was made and sent through various social media handles. The questionnaire included two sections- demographics (age, gender and healthcare course) and knowledge, attitudes and practices questions. For the second section one point was given for correct response and no point for incorrect/unknown answers. Total score range from 0 to 17 with higher score

suggesting more awareness about COVID 19.

The knowledge in optimal hygiene practices of the participants were also tested by including questions relating to hand hygiene techniques based on the 'Five moments of Hand Hygiene' as described by the WHO^[18].

Inclusion Criteria:

- Students in different healthcare courses (eg. MBBS, BDS, Allied health sciences, Nursing) studying in South India.
- Students who have completed at least 6 months in their respective health care courses.

Exclusion Criteria:

- Students of healthcare courses not studying in South India
- Studied in the healthcare course for less than 6 months
- Students who are from fields other than that of health care

Based on the proportion of overall awareness about COVID 19 among health science students in Mumbai (71.2%) observed in an earlier publication (COVID 19 awareness among health care students and professionals in Mumbai metropolitan region, a questionnaire based survey). Statistically significant sample size was calculated to 157 for our study. Informed consent was taken from all the participants who wished to fill out the self-administered questionnaire. The ethical clearance was obtained from the Institutional Review Board (IRB).

A total of 507 responses were collected at the end of the study. The questionnaire was sent to students studying health care courses in South India, who have completed at least six months of training in their respective courses. Consent was obtained from the respondents to use the information given by them for this study. Data was collected for a period of two weeks.

Sub-groups were made based on gender, course of study (MBBS, BDS or Allied Health Sciences) and data was analyzed using IBM SPSS Statistics 20 windows (SPSS Inc, Chicago USA). For the entire continuous variable the results are given in mean and standard deviation and for categorical variable in percentage. To compare the mean difference of knowledge score between (1) Gender: Student t test was used (2) more than two groups: One way ANOVA test was used. P value > 0.005 is considered for statistical significance.

RESULTS

Out of a total of 507 respondents from different healthcare colleges across South India, 71.6% were females and the rest were males. According to the course wise distribution of the healthcare students, 61.7% were from MBBS, 26.2% from BDS, 7.1% from nursing and 5% belonged to the allied health sciences (refer Table 1).

Table 1: Distribution of Respondents according to Course of Study

Course	Number of Respondents	Percentage
MBBS	313	61.7
BDS	133	26.2
Allied Health Sciences	25	4.9
Nursing	36	7.1
Total	507	100

The distribution of the respondent healthcare students according to the year of study is shown in Figure 1. The mean age of the study population was 20.65±1.413 years (Table 2).

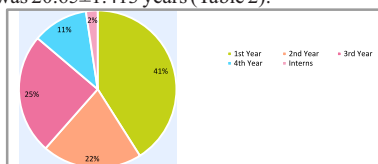


Figure 1: Distribution of Participants According to Year of Study

Table 2: Age Distribution of Participants

Age Group (years)	Number of Participants	Percentage (%)
17-19	113	22.288
20-22	347	68.441
23-25	47	9.271

The mean score of the study population was found to be 12.17±1.927; the maximum score being 16 and the minimum being 3. The mean score of each gender is given in Table 3. The mean score of different courses of study is given in Table 4. For mean scores of different years

of study refer to Table 5.

Table 3: Mean Score According to Gender

Gender	Mean Score	Standard deviation
Male	12.49	1.344
Female	11.54	1.593

Table 4: Mean Score According to Course of Study

Course	Mean Score	Standard Deviation
MBBS	12.47	1.886
BDS	11.61	1.942
Allied Health Sciences	11.40	1.803
Nursing	12.11	1.753
Total	12.17	1.927

Table 5: Mean Score According to Year of Study

Year of Study	Mean Score	Standard Deviation
1st Year	12.09	1.854
2nd Year	11.71	2.079
3rd Year	12.62	1.835
4th Year	12.34	1.782
Intern	11.92	2.575
Total	12.17	1.927

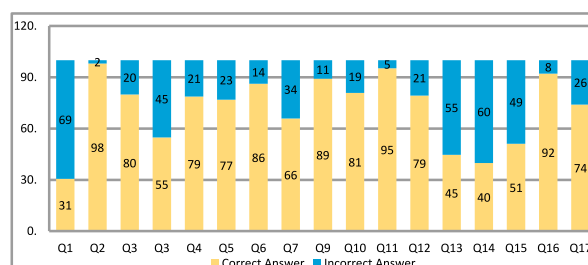


Figure 2: Distribution of Percentage of Correct and Incorrect Answers for Each Question

Comparing the knowledge of MBBS and BDS show statistically significant difference (P value < 0.001), MBBS with AHS statistically significant (P value < 0.038) and MBBS with Nursing does not show any statistically significant difference (P value > 1). Comparing the knowledge of BDS with AHS and Nursing do not show any statistically significant difference (P value > 1). Comparing AHS with nursing shows no statistically significant difference. Comparing Nursing with all the other courses do not show any statistically significant difference.

DISCUSSION

Since the beginning of the pandemic, all sections of the society have been affected and all aspects of life of every individual have faced changes in some way or the other. The health sector has faced major challenges during this pandemic. Due to the massive load of patients, the government had decided to allow undergraduate healthcare students to provide a helping hand in the COVID wards^[19]. So this study becomes a very important tool to realise whether the students are themselves equipped with sufficient information about the pandemic, and to impart them with knowledge which they didn't already have. These basic practices will protect them from getting the infection to a huge extent. As healthcare students, it is expected that they will impart this knowledge to their family and friends and this will help in spreading the hygienic practices faster.

The healthcare students are in general more aware about COVID-19, the correct hygiene practices that need to be observed to safeguard oneself from it, and other related information as compared to the general population because they will have to deal with the patients in their everyday life, and they are being taught this specifically in their curriculum.

Despite the pandemic being the centre of attention for more than the past 6 months only 30.6% of the respondents were aware that the virus which causes COVID-19 is known as Severe Acute Respiratory Syndrome COVID Virus 2 (SARS-CoV-2) and was called 2019-nCoV initially.

Majority (47.3%) marked only SARS-CoV-2 as the correct option. 98% of respondents correctly marked Wuhan city in the Hubei

Province of China as the place where the first cases were reported. Referring to international studies, we found out that medical students in Jordan were split between believing that the infection with COVID-19 is air-borne or not (41.8 and 48.0%, respectively), while 91.0% were sure that the virus is likely to be transmitted through inhalation of infected droplets^[20]. In a similar study by Singh A et al. in the Southern Haryana population, around half of the participants (50.0%) believed that COVID-19 is an air-borne disease, whereas four-fifth of the participants (80.5%) believed that it is spread by direct contact^[21]. In our study, 79.9% of students correctly chose the main mode of transmission of virus from person to person as respiratory droplets. The definition of "close contact", according to WHO, includes both being within approximately 6 feet of a patient with COVID-19 for prolonged period of time, as well as having direct contact with infectious secretions from a patient with COVID-19^[22, 23]. According to this, only 54.8% of the respondents were aware of the correct definition of close contacts.

Majority of the respondents (78.7%) knew that medical advice is indicated for a person suffering from symptoms of cough, fever, breathlessness if he/ she has recently travelled from an area with ongoing spread of COVID-19, is currently residing in an area with ongoing spread of COVID-19 or has been in close contact with a person known to have COVID-19. This disease causes a wide variety of symptoms ranging from fever 98%, cough 76%, fatigue and muscle ache 44%. A fraction of patients also developed headaches (8%), hemoptysis, which is coughing up of blood (5%), and diarrhea (3%).^[24] Our study revealed that 76.9% of the healthcare students had received formal training in hand hygiene in the last three years and 86.2% were conscious about the hand hygiene practices which prevent transmission of the virus to the healthcare worker. But surprisingly only 65.9% were aware that the preferred method of hand hygiene for visibly spiked hands is hand rub with soap and water for at least 20 seconds. Using soap and water can kill the virus effectively as soap destroys the lipophilic outer coat of the virus^[25].

An international study in Saudi Arabia by Alahdal et al, 92% of the respondents favor wearing masks in public, 55% do not recommend wearing masks among healthy individuals^[26]. Results obtained by Singh A et al in which more than four-fifth of the participants (89.6%) believed that wearing a face mask in a crowded place could prevent the transmission of COVID-19^[21]. In our study 89.2% of respondents were cognizant of the fact that face mask is not essential in people who are apparently asymptomatic. Vast majority (80.9%) of the students in our study were conscious that the most effective method for prevention of COVID-19 infection in healthcare settings is by avoiding exposure^[23, 27].

This study showed that 95.3% were knowledgeable about the personal protective equipment (PPE) which should be worn by individuals transporting patients who are confirmed with or under investigation for COVID-19. This is in line with the result obtained from the Mumbai study conducted by Modi P D et al in which 87% of the responders answered correctly^[17]. Unexpectedly, only 79.3% were familiar with the fact that PPE should be worn by healthcare workers who were providing care to asymptomatic patients being evaluated for a non-infectious complaint with a history of exposure to COVID-19.

Majority (55.4%) assumed that the recommended isolation for COVID-19 confirmed patient is an air borne infection isolation room (AIIR) with exhaust; in reality AIIR without exhaust is recommended for such patients.

Only 39.8% of the students were familiar with the proper sequence of wearing a face mask and unfortunately a majority had answered this incorrectly. This is significantly lesser compared to the results obtained by Modi P D et al^[17] in which 45.4% of the responders were aware of the right sequence for the application of a mask/respirator. Proper mask wearing technique is as essential as wearing the mask itself because if not worn properly it can cause decreased protective action.

97.6% of the participants in a study in Southern Haryana^[21] and 90.09% of participants with a health care background in a Mumbai study stated that there is no vaccination against COVID-19^[7]. 92.1% of the participants knew that currently there is no specific treatment for COVID-19 available^[28] and clinical management includes prompt implementation of recommended infection prevention and control measures and supportive management of complications. 74% of the students were aware that aerosol generating procedures should be performed in AIIR as an infection prevention and control method.

The degree of awareness was found to be more among MBBS students out of all the other health science students and more among males than females which was in accordance with findings of other similar studies^[17, 21]. Awareness among third year students for this was found to be more than the other year students.

CONCLUSION

Healthcare students are approached by their families, neighbours and friends regarding news and practices to protect themselves from COVID-19. If they actively impart the right knowledge and practices to these people, then this will serve as a helpful tool to combat this pandemic. For this to happen, the students themselves should have the right knowledge and idea about the practices. The pandemic has been there for more than half a year and despite this the healthcare students aren't equipped with the level of knowledge that is expected out of them. As they are now being recruited in Primary Healthcare Centers in parts of the country where there is excessive burden on the healthcare system, it is essential that the students themselves take an initiative to increase their awareness about the disease.

In the curriculum, there should be inclusion of classes for disaster management which makes them more equipped for facing the pandemic. Students should be made aware about the proper hand washing technique, PPE use and the correct way to wear masks. The PPE and masks' usage should be judicious as these are required on daily basis by the frontline workers and inexpedient utilisation might lead to its shortage. Healthcare students should try on their part to actively make others aware. There should be periodic training session, webinars, and educational interventions for all the healthcare students.

Government should deploy mass media for informing the people and make laws which ensure that the infection's spread can be contained. When people are aware and when such laws are in place, there is a tendency to act more sensibly and it can also help eliminate the unsubstantiated fear to a large extent.

LIMITATIONS

This study was conducted among the educated population who are in the healthcare field, so this cannot be generalized to the whole population. Those with smartphones and internet could access this and those who understand English were able to respond to the form. This is limited to the urban areas, and the findings cannot be extrapolated to people living in rural areas. The duration of study was for two weeks which a short duration of time and hence the number of respondents are less. More time for data collection would have allowed for a larger sample size. The number who people who responded were considerably more from MBBS compared to the other healthcare fields, so the mean score might not be accurate in depicting the awareness among all the healthcare students. Since the self-administered questionnaires were circulated through social media, the response rate could not be calculated.

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APPENDIXES

Questionnaire used for the study.

1) The virus causing COVID-19 infection is called :

- (A) Severe Acute Respiratory Syndrome Coronavirus (SARS)
- (B) Severe Acute Respiratory Syndrome Coronavirus - 2 (SARS-CoV-2)
- (C) 2019-nCov
- (D) Both B and C
- (E) Both A and C

2) First reports of cases were from Wuhan city in the Hubei Province of China.

True or False

3) The Main mode of transmission of virus from person to person is via:

- (A) Respiratory droplets

- (B) Spread from contact with contaminated surfaces or objects
- 4) Which of the following is considered as "close contact"?
- (A) Being within approximately 10 feet (3 meters) of a patient with COVID-19 for a prolonged period of time
 - (B) being within approximately 6 feet (2 meters) of a patient with COVID-19 for a prolonged period of time.
 - (C) Having direct contact with infectious secretions (sputum, serum, blood) from a patient with COVID-19
 - (D) Both: options (B) and (C)
 - (E) Both: options (A) and (C)
- 5) Reported illnesses have ranged from mild to severe symptoms of cough, fever, breathlessness which can appear 2-14 days after exposure. For which of the following situations is medical advice indicated?
- (A) Have been in close contact with a person known to have COVID-19
 - (B) Currently residing in an area with ongoing COVID-19 infection
 - (C) Recent travel from an area with ongoing spread of COVID-19
 - (D) All of the above
- 6) Did you receive formal training in hand hygiene in the last three years? As applicable (Yes/No)
- 7) Which of the following hand hygiene actions prevents transmission of the virus to the health-care worker?
- (A) After touching a patient
 - (B) Immediately after exposure to body fluids
 - (C) After exposure to immediate surroundings of the patient
 - (D) Before putting on and upon removal of personal protective equipment (PPE), including gloves.
 - (E) All of the above
- 8) Preferred method of hand hygiene for visibly soiled hands is:
- (A) Hand rub with soap and water for at least 10 seconds
 - (B) Hand rub with soap and water for at least 20 seconds
 - (C) Use of alcohol based hand sanitizer with at least 60% alcohol
- 9) Use of a face mask is not essential in which of the following groups?
- (A) People who are well, to protect themselves from COVID-19 infection
 - (B) Being in close contact of a person suspected of or known to have COVID-19 infection
 - (C) Healthcare professionals
- 10) Which of the following is the most effective method for prevention of COVID-19 infection in the healthcare setting?
- (A) Avoid exposure (Use Standard Precautions, Contact Precautions, and Airborne Precautions and eye protection when caring for patients with confirmed or possible COVID-19)
 - (B) Vaccination
- 11) What personal protective equipment (PPE) should be worn by individuals transporting patients who are confirmed with or under investigation for COVID-19 within a healthcare facility?
- (A) Gloves
 - (B) Gown
 - (C) Eye protection
 - (D) Respirator - N95 mask
 - (E) All of the above
- 12) What PPE should be worn by HCP providing care to asymptomatic patients with a history of exposure to COVID-19 who are being evaluated for a non-infectious complaint (e.g., hypertension or hyperglycemia)?
- (A) Gloves
 - (B) Gown
 - (C) Eye protection
 - (D) Respirator - N95 mask
 - (E) All of the above
- 13) Which of the following is recommended for isolation of a patient with confirmed COVID-19 and those under investigation for COVID-19?
- (A) Airborne Infection Isolation Room (AIIR) with exhaust
 - (B) Airborne Infection Isolation Room (AIIR) without exhaust
- 14) Which is the proper sequence of wearing a face mask?
- (A) Secure ties or elastic bands at the middle of the head and neck → fix flexible band to nose bridge → fit snug to face and below chin → fit check respirator.

(B) Fit flexible band to nose bridge → secure ties or elastic bands at the middle of the head and neck → fit snug to face and below chin → fit check respirator.

- 15) Which of the following are recommended infection control measures upon arrival of a patient with suspected COVID-19 infection?

- (A) Rapid triage of symptomatic patients
- (B) Implement respiratory hygiene and cough etiquette (i.e., placing a facemask over the patient's nose and mouth if that has not already been done)
- (C) Have a separate, well-ventilated space that allows waiting symptomatic patients to be separated by 6 or more feet.
- (D) All of the above

- 16) Clinical management includes prompt implementation of recommended infection prevention and control measures and supportive management of complications. No specific treatment for COVID-19 is currently available.

True or False

- 17) A recommended infection prevention and control measure is to perform aerosol-generating procedures, including collection of diagnostic respiratory specimens, in an AIIR (Airborne Infection Isolation Room).

True or False

REFERENCE

1. Fauci, A. S., & Lane, H. C. (2020). Covid-19—navigating the uncharted. *The New England Journal of Medicine*, 382(13), 1268–1269
2. Carsetti R, Rosado MM, Donnanno S, Guazzi V, Soresina A, Meini A, Plebani A, Aiuti F, Quinti I. The loss of IgM memory B cells correlates with clinical disease in common variable immunodeficiency. *J Allergy Clin Immunol*. 2005 Feb;115(2):412-7. doi:10.1016/j.jaci.2004.10.048. PMID: 15696104.
3. WHO Director - general's opening remarks at the media briefing on March 2020 [Mar;2020]
4. Menon, Jaideep & Rakesh, PS & John, D & Thachathodiyl, R & Banerjee, Amitava (2020). What was right about Kerala's response to the COVID-19 pandemic?.
5. 5 WHO Coronavirus Disease (COVID-19) Dashboard [Internet]. Who.int. [cited 2020 Nov 19]. Available from: <http://covid19.who.int>
6. India [Internet]. Who.int. [cited 2020 Nov 19]. Available from: <http://www.who.int/countries/ind>
7. Liu, Y., Gayle, A. A., Wilder-Smith, A., & Rocklöv, J. (2020). The reproductive number of COVID-19 is higher compared to SARS coronavirus. *Journal of Travel Medicine*.
8. Jha V, Dinesh TA, Nair P. Are we Ready for Controlling Community Transmission of COVID 19 in India? *Epidemiol Int* 2020; 5(1): 10-13.
9. Jha V, Nair P, Dipu TS, Dinesh TA. Key to Normalcy - Recognising the Extent of COVID-19 Pandemic. *Epidemiol Int* 2020; 5(1): 29-31.
10. Ajilore, K., Atakiti, I., & Onyenakeya, K. (2017). College students' knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: Suggestions for improving future Ebola prevention education programmes. *Health Education Journal*, 76(6), 648–660.
11. Tachfouti, N., Slama, K., Berraho, M., & Nejari, C. (2012). The impact of knowledge and attitudes on adherence to tuberculosis treatment: A case-control study in a Moroccan region. *The Pan African Medical Journal*, 12, 52–52.
12. Babiker, A., El Hussein, M., Al Nemri, A., et al. (2014). Health care professional development: Working as a team to improve patient care. *Sudanese Journal of Paediatrics*, 14(2), 9–16.
13. Askarian, M., Danaei, M., & Vakili, V. (2013). Knowledge, attitudes, and practices regarding pandemic H1N1 influenza among medical and dental residents and fellows in Shiraz Iran. *International Journal of Preventive Medicine*, 4(4), 396–403.
14. Khawaja, Z. A., Soomro, M. I., Pirzada, A. K., Yousuf, M. A., & Kumar, V. (2011). Awareness of the pandemic H1N1 influenza global outbreak 2009 among medical students in Karachi Pakistan. *Journal of Infection in Developing Countries*, 5(3), 151–155.
15. Khasawneh AI, Humeidan AA, Alsulaiman JW, Bloukh S, Ramadan M, Al-Shatanawi TN, Awad HH, Hijazi WY, Al-Kammash KR, Obeidat N, Saleh T. Medical students and COVID-19: Knowledge, attitudes, and precautionary measures. A descriptive study from Jordan. *Frontiers in public health*. 2020;8.
16. Bhagavathula AS, Aldhaleel WA, Rahmani J, Mahabadi MA, Bandari DK. Novel coronavirus (COVID-19) knowledge and perceptions: a survey on healthcare workers. *MedRxiv*. 2020 Jan 1.
17. Modi PD, Nair G, Uppe A, Modi J, Tuppekar B, Gharpure AS, Langade D. COVID-19 awareness among healthcare students and professionals in Mumbai metropolitan region: questionnaire-based survey. *Cureus*. 2020 Apr;12(4).
18. Information for healthcare professionals. (2020). Accessed: March 2020.
19. A step India is taking could make doctor shortage a non-issue in coronavirus battle. (2020). Accessed: October 20, 2020. <https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/a-step-india-is-taking-could-make-doctor-...>
20. Khasawneh A, Humeidan A, Alsulaiman J, Bloukh S, Ramadan M, Al-Shatanawi T et al. Medical Students and COVID-19: Knowledge, Attitudes, and Precautionary Measures. A Descriptive Study From Jordan. *Frontiers in Public Health*. 2020;8.
21. Singh A, Panika RK, Surana A, Gupta V, Goyal P, Singh M. Evaluation of knowledge and perceptions among medical undergraduate students toward novel coronavirus (COVID-19) in Southern Haryana, India: A cross-sectional study. *Indian J Health Sci Biomed Res* 2020;13:91-7
22. Information for healthcare professionals. (2020). Accessed: March 19, 2020: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/index.html>.
23. Jha Vidya, Dinesh TA, Dr Nair Prem. (2020). False Negative: Challenge in COVID-19 containment. *Journal of the Social Sciences*. 48. 1577-1584.
24. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*. 2020 Feb 15;395(10223):497-506.
25. Alzyoud M, Jackson D, Aveyard H, Brooke J. COVID-19 reinforces the importance of handwashing. *J Clin Nurs*. 2020 Aug;29(15-16):2760-2761. doi: 10.1111/jocn.15313. Epub 2020 May 14. PMID: 32406958; PMCID: PMC7267118.
26. Alahdal H, Basingab F, Alotaibi R. An analytical study on the awareness, attitude

- and practice during the COVID-19 pandemic in Riyadh, Saudi Arabia. *Journal of infection and public health*. 2020 Jun 17.
27. Dipu TS, Jha V, Dinesh TA, Nair Prem, M Merlin. Emergence of a post COVID-19 community- an overview. *International Journal of Research and Review*. 2020; 7(7): 153-156.
28. Jha V, Dinesh TA, Nair P. Prioritizing COVID-19 vaccination: challenges and dilemma. *International Journal of Research and Review*. 2020; 7(9): 313-316.